DOCUMENT RESUME

ED 163 407 CS 004 511

AUTHOR Bogle, Meta Eloise
TITLE Conceptual and Perceptual Elements in Sight Word Identification.
PUB DATE May 78
NOTE 22p.; Paper presented at the Annual Meeting of the International Reading Association (23rd, Houston, Texas, May 1-5, 1978)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Auditory Discrimination; *Beginning Reading; *Decoding (Reading); *Listening Skills; *Phonetics; Phonetic Transcription; Primary Education; Reading Instruction; *Reading Research; Sight Method; Sight Vocabulary; Visual Discrimination; *Word Recognition

ABSTRACT

The responses of 84 children (42 in kindergarten and 42 in first grade) while trying to identify sight words that were similar in sound (bowl/pole), similar in sound and shape (boat/boot), or dissimilar (cup/moon) yielded information about phonetic composition as a source of information by which beginning readers identify sight words. The responses occurred under both auditory and pictorial stimulus conditions. The results show that in the auditory condition correct responses occur more frequently when words are similar in sound and shape, while in the pictorial condition correct responses occur more frequently for words similar in sound only. Mental age was related to more correct responses for all three classes of words. These findings suggest that the selection of reading materials, approaches, and strategies should reflect the attitude that reading is not just a visual activity, and that teachers should attend to the listening skills of beginning readers as well. (RL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED163407

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Name: META ELOISE BOGLE

Professional Affliation: UNIVERSITY OF THE WEST INDIES

Mailing Address: SCHOOL OF EDUCATION
U.W.I.
MONA, JAMAICA, W.I.

Title: CONCEPTUAL AND PERCEPTUAL ELEMENTS IN SIGHT WORD IDENTIFICATION

Meeting Identification: Research Report, May 3, 1978, 3.45 p.m.
Hyatt Regency Hotel, Redbud Room

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Meta Eloise Bogle

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

CS004511

Introduction

The realities of living today whether in developed or developing countries, viewed superficially, could suggest that the ability to read can be a useful but not necessary acquisition. The development of the electronic media has tended to influence the thinking of the world's peoples in this direction. Indeed, the young in many situations can hardly be expected to feel the need to learn to read. Alongside this development has been the increase in oil prices with its effect on petroleum products and by-products, and machinery dependent on petroleum-produced power. This has threatened to make the electronic media less easily accessible. At the same time, the trend towards a shorter working week with its concomitant longer hours for leisure-time activities as well as the increase in unemployment, have been pointing to the need for the educational process to give more attention to personal development.

These two circumstances (the threatened inaccessibility of the electronic media, and the effects of the work situation) among others seem to be underscoring the need to acquire the ability to read efficiently. This makes it incumbent on teachers to look more closely at the process of learning to read and to utilize the gleanings in the care they give to the teaching of reading.

The investigation which became the basis of this paper is part of an attempt to deal with both these concerns. Though the investigation treats the identification of sight words, it does not support the idea of word identification as synonymous with reading. The concern with the process of identification is an acceptance of it as a basic and not as a terminal process. The focus on sight words is an acknowledgement that the acquisition of words as sight words is needed to facilitate the speed of identification necessary if the process of extracting meaning is not to be frustrated.

These sight words are words which a reader correctly identifies without needing to have recourse to detailed visual and auditory analysis and conscious visual-auditory integration. The fact that a reader has a specific word as a sight word does not in any way describe the process by which he has acquired that word; nor does it offer any identification of the clue by which the reader ascertains that word's identity.

For these reasons the acquisition of a word as a sight word cannot reveal whether the reader has made the necessary transformation of the more usual temporal sequence of the auditory stimulus into the less familiar or virtually unknown spatial sequence of the visual stimulus. From these observations it is possible to conclude that without attention to the process(es) of acquisition it is not reasonable to use the acquisition of sight words as grounds for expecting general facility with word identification. In order to be informed on these processes it is useful to examine relevant research findings.

Process in Word Identification

The findings of a number of investigations provide clues to the identity of some processes in the identification of sight words. Studies by Bennett (1942), Lott (1969 a), King and Muehl (1965) and Samuels (cited by Williams, 1971), for instance, have produced evidence for the use of attentional processes in the learning of sight words. From these findings potent features in attentional processes appear to be those of *position* (also supported by Marchbanks and Levin, 1965, and by Shankweiler and Liberman, 1972), *meaning context* and *syntactic context* (Bennett, 1942). The influence of *condition* of introduction or presentation has led to that factor being identified as having significance for attentional processes (Samuels, 1967; Braun, 1967; Harris, 1967). These researchers demonstrated the potential of mode and circumstance (e.g. with picture, or hearing with no picture) of introduction or presentation for being distractors which divert attention to inefficient cues not specific to the task.Kuenne and Williams (1973) have suggested that the *composition of the unit of attention* may also be important to the attentional process. "Composition" here refers to the combination of letter classes which constitute the unit of attention. From their findings (also supported by Swanson, unpublished dissertation 1974), the consonant-vowel unit is a salient cue in cross-modal (visual-auditory, auditory-visual) as well as in intra-modal (visual-visual, auditory-auditory) matching. These findings all suggest an attendant scanning process. It will be noted that the emphasis of most of the research is on the visual aspects or properties of the stimulus. However, it should also be noted that

Bennett's interpretation of her findings assumed the use of auditory properties but without any indication of how these properties may be utilized.

Lott (1969 a) analysed her findings in terms of "criterial sets" which assumes the use of processes of selection and encoding (as labelled by Bower, 1972). The engagement of encoding processes has been suggested by findings by King and Muehl (1965). There is every indication that selection is not confined to single features or to individual properties of the sitmulus. The selection of combinations of features makes demands for processes of integration which appear to be utilized in the act of identification (Bennett, 1942; Lott, 1969 a). However, although their findings have identified the integration of cues from the visual and auditory properties of the stimulus there has been no indication of the nature and extent of the involvement.

Since the cues selected and encoded must be retrieved in order for identification (whether through matching or naming) to take place, retrieval processes are implied. The findings by Lott and by King and Muehl could suggest that in the process of retrieval, selected and encoded components which define difference or uniqueness reinforce each other. In the latter study, the components could have been selected from visual, semantic, and auditory (phonological) dimensions separately or in varying combinations. A further observation relates to how the processes of selection, encoding and retrieval may function. The studies by Samuels and by King and Muehl have suggested that utilization of these processes may be differential and may be influenced by the degree of similarity or contrast on the dimensions of the stimulus.

Together with the findings from Lott's (1969 b) study, these observations point to the use of *contrast* as the background against which the learner gleans adequate information for the process of identification. The study by Samuels strongly suggests that the process of word identification may operate within the limits of maximum and minimum levels of contrast; that is, in the presence of both too much or too little contrast on a given dimension or combinations of dimensions, information adequate for identification may not be gleaned. Thus, when young subjects tried to learn four (4) words which were visually dissimilar, a picture as a clue seemed to operate as a distractor by providing yet another dimension of difference thus producing too high a level of

contrast; this extensive contrast operated to produce frequent errors in identification. However, when in another investigation (King and Muehl) young subjects tried to learn visually similar words, the presence of a picture became a useful attentional element providing a dimension on which the needed difference could be noted; this resulted in significantly fewer errors than under the visually dissimilar condition.

An additonal pointer from the study by Lott (1969 b) is the association of the less advanced younger readers with the use of higher levels of contrast. This feature may suggest an association of levels of contrast with attentional processes and with mental development.

In summary, processes in the identification of sight words may be identified as focusing essentially on attention, selection, encoding, integration and retrieval, engaging components of a range of dimensions including the visual, auditory (or acoustic), and semantic, and operating on levels of contrast in terms of the dimensions used. Differential utilization of these components or cues characterises the process of word identification; and the utilization is dependent on the adequacy of the information yielded by contrast on a single dimension or on combinations of dimensions.

Properties of the Stimulus

The research evidence does give some further pointers regarding the utilization of information from the various properties of the stimulus – the word – in the task of word identification. There is the suggestion, for instance, that locating the unit of attention may be a problem for the beginning reader. Kuenne and Williams (1973) produced findings which demonstrate a difference between the preference for cues on a visual recognition task and the preference on an aural recognition task. Thus, the beginning reader with his accustomed attention to aural presentations, may have to acquire new attentional strategies for the reading task as it makes heavy demands on visual recognition. The findings by Kuenne and Williams suggest that the difference exists both in size and position of the unit. Such differences in the use of potential

attentional cues could affect the processes of encoding and integration. In fact, the study by Kuenne and Williams produced results which support this suggestion. A follow-up study by Swanson (in an unpublished doctoral dissertation, 1974) has given the same pointer. When the subjects of this latter study were required to make an auditory (oral) identification of a visually presented stimulus the results were more consistent and certain than when the auditorily presented stimulus required a visual identification. Under the latter condition subjects made "no response" more frequently, and more frequently selected two or more cues.

Whichever of these two conditions of presentation describes the position of the beginning reader, implies the process of integration. How he perceives the reading task, however, may affect the operation of that process.

Another study which identifies a related concept is that by Shankweiler and Liberman (1972). Differences in vowel and consonant errors in hearing (when compared with reading) by second and third graders, pointed to a superiority of vowels over consonants in the hearing situation; (supported also by Crowder, 1971). This accords with what is known about the characteristics of vowels and consonants in speech production and reception (e.g. Liberman, et al, 1972; Hintzman, 1967; Clark and Stafford, 1969). It would seem then, that the auditory-visual integration identified earlier as being necessary, will require specific conditions in order to be efficient. Combined with one of the indications from the Lott (1969 b) study, it could lead to the conclusion that classes of features for attention and hence for integration may be associated with development; (it may be recalled that younger subjects needed a higher level of contrast in order to effect identification). Since the visual representation of vowels does not reflect the stronger signals (cf consonants) of their auditory representation, and since the variability of vowel sounds makes their visual represntation less easily recognizable, the beginning reader will need to have achieved conceptual development with a minimal level of facility with abstracting and conservation before he will be able to extract adequate information for necessary meaningful integration.

The foregoing presentation was intended to identify the assumption that

visual (perceptual) and "linguistic" (conceptual) components of the stimulus need to interact in the process of identification. Translated into practical terms, this means that the beginning reader who visually perceives book and king but does not possess the concept that the spatial location of "k" in each word is reflecting the temporal location of /k/ in the auditory presentation of that word, may attend to "k", select it as a cue when the visual forms are presented separately, and therefore be unable to make a consistently correct identification. Or, put in other words, he will need to be able to glean information from more than one source relevant to the stimulus and to integrate this information to help him in the process of immediate identification. The process of integration is efficient when it reduces the variety of information to the fewest possible categories which will facilitate an immediate response. But this efficiency will be further determined by the quality of the information gleaned from each source; this quality may be defined both in terms of type and accuracy. Perhaps the efficiency here described may find a parallel in Bruner's concept of easing the "cognitive strain".

A Structure of the Process and its Elements

The outline of the process of identification presented in the preceding sections is consistent with the model offered by Morton (1968). That model views the information needed for identification as coming from the various properties (visual, acoustic, and semantic) of the stimulus. These properties are members of one of two systems: contextual and sensory. Identification assumes previous recognition, and the process occurs through a "logogen system" which is defined by the information it can accept and the response it makes available. The logogen corresponding to words operates with a certain amount of information independent of the source of that information. The activation level is decided by each logogen but a response becomes available only when the amount of information (the "threshold") is reached. At that point the response can be made, or alternatively fed back into the logogen system through a rehearsal loop. Several responses to a single stimulus may become available. The high frequency of occurrence or repetition of a given word may produce a lower threshold than may exist for a word of low-frequency. A low threshold, and information from the context

system may have an effect equivalent to that of reducing the amount of sensory information needed. The amount of information from the sensory system is assessed in terms of duration, contrast, signal-to-noise ratio, but unlike that from the context system, is transient unless it is transformed. Transformed sensory information becomes a type of context information with the self-sustaining characteristic of that system. The origninal accuracy of the information from the source system will determine the accuracy of the response.

The model leaves open the matter of the nature of the transformed information. In fact, the reference of this paper to integration has not dealt with that aspect. But Mackworth (1962) has identified verbal coding in which the representation is a synthesis of visual, articulatory, and auditory representational forms. Thus a visually presented stimulus may exist simultaneously as a visual representation and as a verbal representation which synthesizes all the information gleaned from the various properties of the stimulus. Conrad (1963, 1964), Baddeley (1966), Corcoran (1966, 1967), Steinheiser (unpublished doctoral dissertation, 1970), Murray (1967) and Thomasson (1970) have all provided evidence of verbal encoding which suggests auditory processing of visually presented verbal material. However, the research does not make it clear whether the use of auditory memory on visual tasks is a matter of habit or of necessity. A feature that is sustained, however, is that vowels and consonants are differentially coded.

In addition, auditory processing seems to reflect speech preception said largely to be determined by acoustic patterns which in turn are determined by place of articulation. Articulatory features can therefore be expected to influence auditory processing. Similarity on some dimensions of articulation has been observed to be associated with adverse effects. Among these adverse effects are the decrease in the size of memory span (Conrad and Hull, 1964), the retardation of the acquisition and retention of items (Dallett, 1966), responsibility for recognition errors (Felzen and Anisfeld, 1969), and confusions resulting in substitutions and transpositions (Conrad, 1959, 1965; Baddeley, 1966; Hintzman, 1967). The implication is that articulatory features, and more specifically the phonological class of

features, are coded in memory (Jenkings, Foss and Greenberg, 1968). There are indications that voicing and place of articulation, for example, are independently coded and retrievable features (Hintzman, 1967). Felzen and Anisfeld (1969) found a stronger influence of phonetic relations for younger than for older subjects. Conrad (1971) demonstrated a similar trend, thus supporting a developmental trend in the use of this class of features. He has indicated that up to a mental age of approximately five years, subjects do not have a phonological code available for use and so rely on the visual code in processing visually presented material.

This brief presentation has identified the following as involved in the auditory processing of visually presented verbal material: voicing and place of articulation – as independently coded and retrievable features; differentially coded consonants and vowels; and coding of items in relation to each other and in terms of phonological features. It needs to be noted that these aspects are not specifically labelled in the visual stimulus yet they may provide the information needed for the identification of the stimulus. These features which in part describe the phonetic composition of words, identify phonetic composition as a source of information. Information from that source can be expected to operate on the principles outlined in the description of Morton' model; hence an inaccuracy occurring through loss of a feature, for instance, can lead to an inaccurate response.

Phonetic composition as a source of information has another representation, the graphological, which uses an arbitrary though systematized set of symbols in providing a model of a word's sound structure defined by the word's phonetic composition. Information from this representation of the source will need to be integrated with information from the representation described above. Essentially, the process is one of symbolization; the learner will need to transform symbols from one modal source into equivalent symbols of a different modal source. Such processes of symbolization can be expected to be heavily dependent on conceptual development since the learner will need to be able to recognize a relationship between the sequence of sounds constituting a word when heard and the spatial organization of that word presented visually.

As can be implied from the earlier discussion, a potential problem arises out of

the fact that some important features of the auditory representation of a word coded in memory are not specifically labelled or equally emphasized in the visual representation. The learner will therefore need to use the visual form as a primary source for generating a secondary source from which to extract information. Further, he must link the point(s) of similarity or contrast in the information from the secondary source with similarity or contrast in the primary source so as to have a readily available cue for the retrieval process demanded in identification. This feature of the processing gives great importance to similarity effects demonstrated in the research. In addition, the influence of contrast on attentional processes cannot be ignored. Thus, the degree of contrast in terms of the phonetic composition of words may exert an influence on the amount of information needed for the identification of sight words.

The investigation reported here attempted to examine the concept of phonetic composition as a source of information in the identification of sight words by beginning readers. Stimulus condition (auditory, pictoral) and grade level were introduced as variables which might influence the use of this source of information.

Procedure

Three word-classes were used to attempt to control for the use of shape as visual information; thus the investigation used words similar in sound and shape (boat, boot), words similar in sound (bowl, pole), and dissimilar words (cup, moon). There were two pairs of each class presented under a given stimulus condition; and each subject was involved in both stimulus conditions.

The words were selected on the basis of frequency of occurrence, familiarity, potential for being clearly illustrated (all in terms of the age group of the sample), as well as on the basis of the number of syllables, and shape and phonetic composition combined. Phonetic composition was viewed in terms of source (voicing), resonater feature, place of articulation, and duration. Two words which differed on a single factor were judged to be similar. The words were presented in a training-testing exercise which required subjects to identify each word by naming it; the responses in each test were recorded. The correct recorded responses were subjected to an analysis by

means of repeated measures design with a total of six dimensions two of which were introduced as counterbalancing measures. The search was for the main and interactive effects of word class, condition, and grade level. The Duncan (1955) multiple range test of significance was applied to locate specific pairwise contrasts which represent significant differences. The false responses were subjected to classification and a qualitative analysis.

The sample consisted of preschoolers (average age 5 years 6 months and with no formal instruction in reading) and first grade children (average age 6 years 6 months receiving reading instruction through a basal reader emphasizing language development). The subjects were further characterized by assessed competence in the use of word identification skills and by menatal age on a hearing vocabulary test.

Results

The main effects for word class, condition, grade level and trial were significant ($p < .01$); so too were the interactions between word class and grade level, and word class and condition ($p < .01$). When the correct responses were analyzed separately for each grade only the main effects of word class ($p < .01$) and the interaction of word class and condition ($p < .01$) persisted at the Grade One level. At the kindergarten level the relevant effects of the total sample persisted. For the grade one sample a high frequency of correct responses to words similar in sound and form occurred under the auditory condition but under the pictorial condition words similar only in sound produced more correct responses. The pattern for the kindergarten subjects under the auditory condition was the same but under the pictorial did not differentiate between the classes of similar words. These results may be rewritten to say that the auditory condition differentiated between the classes of similar words while the pictorial differentiated between grade levels when the classes of similar words were considered.

Mental age was associated with increase in scores on all three classes of words. However, degree of association varied with word class and condition; yet the degree of association on words similar only in sound was approximately the same under both conditions.

Discussion of Results and Implications

These results reveal that word class effects in the word identification task were dependent on the effects of condition and grade level. As the words decreased in similarity, the number of correct responses by the grade one subjects increased over that of the kindergarten subjects. When similarity was on one dimension only (e.g. on the sound dimension as in bowl, pole), kindergarten subjects found it more difficult to make correct responses. This could suggest that the younger subjects were using high degree of similarity as a signal for attention. However, a condition effect calls for modification of this interpretation. Under the pictorial condition there was no difference between the two classes of similar words while under the auditory condition similarity on two dimensions seemed to have influenced a larger number of correct responses. When the false responses by the younger subjects were analyzed, there was a significantly higher frequency of transpositions among words similar only in sound. This was the pattern under both conditions. It was observed that on this class of words subjects often confused members of a pair and as often could identify only one member of the pair while indicating the loss of the other.

When place and manner of articulation were considered in the analysis, the grade one subjects had a high frequency of omissions among words similar in sound; place of articulation was associated with this performance under both conditions. Manner of articulation was associated with high frequency of omissions among this same class of words but only under the auditory condition. For the kindergarten subjects, a difference in manner of articulation was associated with a high frequency of omissions among words similar in sound and visual form under the pictorial condition, place of articulation was associated on the same factor with words similar in sound under the pictorial condition also. Thus grade level did differentiate between these two articulatory features.

That similarity in the sound aspects of words can exert some influence on identification, is further suggested by the observation that under both conditions many subjects used a single letter to generate a sound which they then attempted to match in memory. This was the interpretation placed on the response fish when the stimulus was knife, or duck when the stimulus was queen.

The pointer seems to be to the need that subjects in the sample appeared to have for auditory processing even when the condition was pictorial. The evidence suggests that such processing may be supplementary, the effectiveness being dependent on contrasts on both visual and auditory dimensions. The omissions and transpositions occurring in the false responses may have resulted from a lack of conscious awareness of the position of the sound differences; such awareness may have been needed for the adequate use of visual contrasts or to search for these contrasts. The condition effect supports the suggestion that information from the auditory source can influence the perception of the visual properties of the stimulus. The younger subjects' poorer performance under the pictorial condition may have been a result of their lack of facility with the sound code (Conrad, 1971). These younger subjects frequently identified words under the auditory condition as rhyming words but made no such observation under the pictorial condition.

The absence of knowledge of the sound structure of words seemed to have made it difficult for these subjects to match an identified sound segment with its critical position in the word they produced. Thus /f/ was often identified in knife but issued in the response fish or vice versa; similarly, "q" in queen was vocalized as /k/ but produced the response duck. In the absence of the knowledge or concept of the sound structure of the word, auditory factors can serve to confuse the young when in the absence of an adequate amount of information they use these factors as constraints. Under these circumstances, similarities in sound elements provide opportunities for confusion. This involvement of sound elements imply that phonetic relations between words could have some importance.

The performance in the experimental task seems to assign a central role to the use of contrasts on a variety of dimensions in order to achieve a "required amount" of information. The influence of "amount" of information was also demonstrated in a study by Niles (1975); however that study investigated essentially visual perceptual features. The present study seems to indicate that the information is not purely perceptual since conceptual information appears to be able to make good the deficit in purely perceptual information. The absence of conceptual

information may retard progress in the word identification task.

Perhaps the above observations are supportive of theories which isolate the sound structure of words as an item for attention in teaching (Elkonin, 1973). Attention to the development of such a concept would help the young learner to be ready to discriminate not solely in terms of the existence of a difference but also in terms of the location of that difference. Acceptance of this procedure in teaching raises the question of when to begin offering aid to development in this direction.

The focus on "required amount" of information independent of source implies the need to help the learner develop abilities in seeking for and using information. It would further imply the need to develop concepts of relationships and inter-relationships.

Also of importance is the matter of the condition of introduction of words in the attempt to facilitate attentional processes and especially in the utilization of auditory factors in those processes. Though the use of a picture need not be discontinued, it may be useful to consider its use as supplementary to other ways of introducing word forms. Young learners might need to hear the sound of words in order to do the apparently necessary auditory processing. It may be that hearing the sound offers a necessary opportunity for rehearsal in order to help them generate a sound code which becomes more accessible under conditions of immediate recall.

In addition, the teacher may need to make decisions about what cues to bring to the beginner's attention; some cues are uneconomical or encourage the use of visual information only; in some instances efficient cues cannot be slected without specific aid. The findings could also be pointing to the need to select sequences of presentation in a manner that will develop other necessary strategies of information processing.

The selection of materials, approaches and strategies of presentation should be based on the principle that reading is a visual activity only in part; it in fact engages other important non-visual aspects of reality.

The results and discussion have suggested implications for classroom practice

generally. Each of these implications must be extended to the more specialized situation of teaching reading to the linguistically different since the engaging of auditory processing is dependent on their speech preception which in turn is influenced by speech production defined in terms of acoustic patterns produced by articulatory factors.

This would mean that the teacher of the linguistically different will need to be able to identify phonetic differences between the learner's language and the traditional representation of the language in which he is learning to read. Such identification is needed to help the teacher make decisions about the attentional cues to be emphasized since the learner is likely to attend only to those he can retrieve from, or map on to his sound code. For example, he might in the process of mapping be confused by homonyms in his speech and not signalled in the written form of the language he is reading. The result could very well be the absence of a response as there would be no message to which to respond. Perhaps some phonic elements taught may disorient the beginning reader for this very reason: there is no sound code on to which to map a phonic element he never produces. Later, in learning to read the more personalized art form, poetry, he could have difficulty in using the poet's sound system and therefore get no meaning or miss some of the meaning.

Since this auditory processing could be of importance in learning to read, it seems also to call for serious attention to the teaching of listening as a pre-requisite to beginning reading. This would be of special importance in situations where social and cultural differences do not emphasize efficiency in the use of this battery of skills.

It remains, however, to test these as well as other implications especially as they apply to the non-standard dialect speaker or the linguistically different.

REFERENCES

BADDELEY, A.D. "Short Term Memory for Word Sequences as a Function of Acoustic, Semantic, and Formal Similarity" *Quarterly Journal of Experimental Psychology, XVIII* (1966) 362 – 365.

BENNET, Annette. "An Analysis of Errors in Word Recognition made by retarded Readers," *The Journal of Educational Psychology*, 33 (1942), 25 – 38.

BOWER, Gordon H. "Stimulus-Sampling Theory of Encoding Variability," *Coding Processes in Human Memory*, eds. Arthur W. Melton and Edwin Martin V.H. Winston and Sons, 1972.

CLARK, H. H. and STAFFORD, R.A. "Memory for Semantic Features in the Verb," *Journal of Experimental Psychology*, LXXX (1969), 326 – 334.

CONRAD, R. "Acoustic Confusions and Memory Span for Words," *Nature*, 197 (1963), 1029 – 1030.

———— "Acoustic Confusions in Immediate Memory," *British Journal of Psychology*, 55 (1964), 75 – 84.

———— "Speech and Reading," *Language by Ear and by Eye*, eds. James F. Kavanagh and Ignatius G. Mattingly. Massachusetts Institute of Technology, 1972.

———— and HULL, A.J. "Information, Acoustic Confusion and Memory Span," *British Journal of Psychology*, LV (1964), 429 – 432.

CORCORAN, D.W. "An Acoustic Factor in Letter Cancellation," *Nature*, 210 (1966), 658.

CROWDER, Robert G. "Visual and Auditory Memory," *Language by Ear and Eye*, eds. James F. Kavanagh and Ignatious G. Mattingly. The Massachusetts Institute of Technology, 1972.

DALLET, K.M. "Effects of Within List and Between List Acoustic Similarity on the Learning and Retention of Paired Associates," *Journal of Experimental Psychology*, LXXII (1966), 667 – 677.

ELKONIN, D.B. Chapter 24, *Comparative Reading*, ed. John Downing, MacMillan Co., 1973.

FELZEN, E. and ANISFELD, M. "Semantic and Phonetic Relations in the False Recognition of Third and Sixth Grade Children," *Developmental Psychology*, III (1970), 163 – 168.

HINTZMAN, D.L. "Articulatory Coding in STM," *Journal of Verbal Learning and Verbal Behaviour*, VI (1967), 312 – 316.

JENKINS, J.J., FOSS, B.J. and GREENBERG, J.H. "Phonological Distinctive Features as Cues in Learning," *Journal of Experimental Psychology*, LXXVII (1968), 200 – 205.

KING, E.M. and MUEHL, S. "Different Sensory Cues as Aids in Beginning Reading," *The Reading Teacher*, December, 1965.

KUENNE, Janet B. and WILLIAMS, Joanna. "Auditory Recognition Cues in the Primary Grades," *Journal of Educational Psychology*, 64, 2 (1972), 241 – 246.

LIBERMAN, A. M., MATTINGLY, I.G. and TURVEY, M.T. "Language Codes and Memory Codes," *Coding Processes in Human Memory*, eds. A.W. Melton, and E. Martin. John Wiley and Sons, 1972.

LOTT, Deborah. Functional Equivalence of Feature Cambinations in the Visual Identification of Words. University microfilm copy. Ann Arbor, 1969a.

———————— The Use of Redundancy by Beginning Readers. University microfilm copy. Ann Arbor, 1969b.

MACKWORTH, J.F. "The Visual Image and the Memory Trace," *Canadian Journal of Psychology*, 19 (1962), 55 – 59.

MARCHBANKS, Gabrielle, and LEVIN, H. "Cues by which Children Recognize Words," *Journal of Educational Psychology*, LVI (1965), 57 – 61.

MORTON, John. "Interaction of Information in Word Recognition," *Psychological Review*, 76 (1969), 165 – 178.

MURRAY, D.J. "Articulation and Acoustic Confusability in Short-Term Memory," *Journal of Experimental Psychology*, LXXVII (1968), 679 – 684.

NILES, Jerome A. "The use of featural and letter dependency information in word recognition by elementary school children," *Reading Research Quarterly*, XI 2(1975), 198 – 202.

SAMUELS, S. Jay. "Attentional Processes in Reading: The Effect of Pictures on the Acquisition of Reading Responses," *Journal of Educational Psychology*, 58 (1967), 337 – 342.

STEINHEISER, F.H. Phonemic distinctive feature encoding from visual information storage. Unpublished doctoral dissertation, University of Cincinnati, 1970

SWANSON, Ingrid , Word Recognition Cues Used in Matching Verbal Stimuli Within and Between Auditory and Visual Modalities. Unpublished doctoral dissertation, University of Arizona, 1974.

THOMASSON, A.J.W.M. *On the Representation of Verbal Items in Short-Term Memory*, cited by R. Conrad, "Speech and Reading," *Language by Ear and by Eye*, ed. James F. Kavanagh and Ignatius G. Mattingly, Massachusetts Institute of Technology, 1972.

ITEMS FOR PICTORIAL PRESENTATION

TRANSGENERATED LISTS

FORM 1A

a	boat
	boot
	mail
	nail
b	goat
	coat
	tree
	tray
c	fish
	cup
	moon
	knife

FORM 2A

b	goat
	coat
	tree
	tray
c	fish
	cup
	moon
	knife
a	boat
	boot
	mail
	nail

FORM 3A

c	fish
	cup
	moon
	knife
a	boat
	boot
	mail
	nail
b	goat
	coat
	tree
	tray

Table 8. Selections from Analysis-of-Variance Summary Table for Effects in Total Sample (N = 84)

Source	df	Sum of Squares	Mean Square	F ratio
Among subjects	83			
Group Level (A)	1	610.79	610.79	83.06***
Condition Sequence (E)	1	4.34	4.34	.60
Word Class Sequence (F)	2	3.80	1.90	.26
...	...	...	...	...
Subjects within (AEF))	72	520.78	7.23	
Within subjects	1140			
Condition (B)	1	18.45	18.45	11.33***
Interaction AB	1	6.75	6.75	4.14*
...	...	...	...	...
RB(AEF)	72	187.25	1.63	
Word Class (C)	2	79.90	39.95	31.52***
Interaction AC	2	26.68	13.34	10.50***
EC	2	12.89	6.45	5.07**
...	...	...	...	...
RC(AEF)	144	182.98	1.27	
Trial (D)	2	76.21	38.11	56.88***
Interaction AD	2	10.18	5.09	7.60***
...	...	...	...	...
RD(AEF)	144	96.46	.67	
BC	2	50.68	25.34	22.22***
BCA	2	3.01	1.50	1.33
...	...	...	...	...
RBC(AEF)	144	164.22	1.14	
BD	2	7.72	3.86	5.16**
...	...	...	...	...
RBD(AEF)	144	107.79	.75	
DC	4	7.38	1.85	2.78*
...	...	...	...	...
RDC(AEF)	288	198.06	.69	

* F ratio significant at .05 level
** F ratio significant at .01 level
*** F ratio significant at .005 level

ITEMS FOR AUDITORY PRESENTATION

TRANSGENERATED LISTS

FORM 1B

a	horse
	house
	gun
	gum
b	bowl
	pole
	glass
	grass
c	duck
	key
	nurse
	queen

FORM 2B

b	bowl
	pole
	glass
	grass
c	duck
	key
	nurse
	queen
a	horse
	house
	gun
	gum

FORM 3B

c	duck
	key
	nurse
	queen
a	horse
	house
	gun
	gum
b	bowl
	pole
	glass
	grass

Figure 7. Examples of Confusions on the Word Identification Task.

Stimulus Word	Response
Auditory Condition	
horse	house, nurse
house	horse
gum	grass, gun
gun	gum
bowl	blow, ball, pole
pole	hole, bowl
duck	key, queen, dish
key	duck, queen, cake, king
nurse	horse, house, case, under, doctor
queen	duck, key, tree, grass, gun, gum, up, king
Pictorial Condition	
boat	boot, goat
boot	boat
mail	nail, moon
nail	mail, pail, knife
coat	goat, tree, tray, boat, knife, cup, cat
goat	coat, tree, tray
tree	goat, coat, tray
tray	goat, coat, tree
fish	knife
cup	knife
moon	star
knife	fish, nail, cup, coat, key, coffee